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CHARACTERIZATION OF FISHERY EFFECTS ON SIGNIFICANT ECOSYSTEM COMPONENTS OF THE PROPOSED SCOTT ISLANDS MARINE NATIONAL WILDLIFE AREA

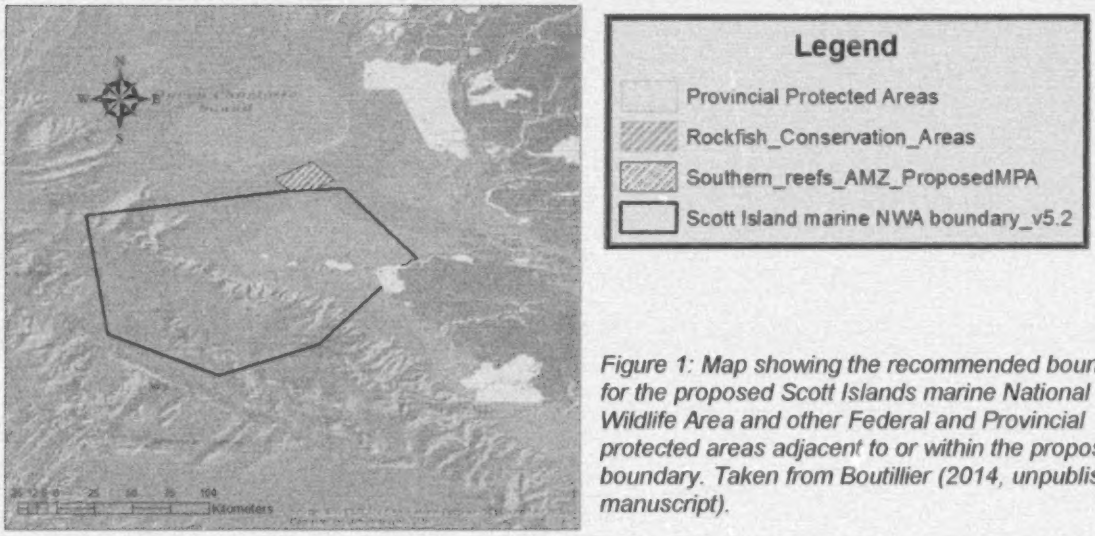

Figure 1: Map showing the recommended boundaries for the proposed Scott Islands marine National Wildlife Area and other Federal and Provincial protected areas adjacent to or within the proposed boundary. Taken from Boutillier (2014, unpublished manuscript).

Context:

Canada's Oceans Act and Oceans Strategy commit Fisheries and Oceans Canada (DFO) to leading the development and implementation of a sustainable, precautionary and integrated ecosystem approach to oceans management. As part of this commitment, the Oceans Program is coordinating efforts within DFO and across other Federal and Provincial agencies to develop bioregional networks of Marine Protected Areas (MPAs) in the Pacific Region and contribute to both regional and national integrated ecosystem-based management approaches. This effort in the Pacific Region is coordinated through a joint Federal/Provincial team called the Marine Protected Areas Network Team (MPANT).

The proposed Scott Islands marine National Wildlife Area (NWA) is the first marine NWA which will contribute to the Network. Departmental mandates commit DFO to managing anthropogenic impacts, including fishing, in a manner that ensures sustainable utilization, conservation of biodiversity, protection of the productivity of commercial, recreational and Aboriginal fisheries, and protection of species at risk. The legal authority for this mandate derives from the Fisheries Act, the Oceans Act and the Species at Risk Act (SARA), and from ratified international agreements such as the Convention on Biological Diversity (CBD), and the United Nations General Assembly (UNGA) Resolution 61/105.

While Environment Canada (EC) is the lead agency for the establishment of NWAs, DFO retains the regulatory authority for management of fisheries within NWAs. Therefore, in consultation with EC, DFO's Ecosystem Management Branch (Oceans Program) and Fisheries Management have requested that Science Branch provide advice regarding the extent and nature of risks from commercial fishing activities on marine bird species, their habitats, and the ecosystem functioning and community properties within the proposed Scott Islands Marine National Wildlife Area. The information and advice resulting from this request will inform the development of an integrated ecosystem management plan for the Scott Islands NWA, identify information gaps and research needs in the understanding of fisheries/marine bird interactions in the NWA geographic

area, and contribute more broadly to the development of the Northern Shelf Bioregion MPA Network in the Pacific region.

This Science Advisory Report is from the August 6-7, 2014 meeting on Characterization of Fishery Effects on Valued Species, Habitat and Ecosystem Components of the Proposed Scott Islands marine National Wildlife Area. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- The Scott Islands marine National Wildlife Area (SImNWA) is being established to protect the marine habitat of the largest and most diverse seabird colony in Pacific Canada. Environment Canada (EC) is the lead agency for the establishment of NWAs while Fisheries and Oceans Canada (DFO) has the regulatory authority for the management of fisheries within NWAs.
- An evaluation was conducted of the data, information, and analyses available and needed to support both qualitative and quantitative ecological risk assessments of commercial fishing activities in the proposed SImNWA. The evaluation was structured using the Ecosystem Risk Assessment Framework (ERAF) developed to support marine spatial planning in Pacific waters by DFO (DFO 2012). The ERAF incorporates the Pathways of Effects (POE) approach to assessing stressor impacts on significant ecosystem components (SECs).
- The evaluation provided illustrative examples of both the ecological consequences of commercial fishing, and the level of exposure from commercial fishing on representative species, habitat, and ecosystem/community property SECs that were selected for evaluation based on the proposed goals for the SImNWA (EC 2013).
- Fishing activities that may impact SECs, as illustrated through the POE approach, have historically occurred and continue to occur, in SImNWA. Stressors from these activities include direct mortality of seabirds (species SECs), mechanical disruption and settling of remobilized sediments on physical and biogenic habitats that support seabirds or their essential prey organisms (habitat SECs), and alterations in food web dynamics through the provision of alternative food sources resulting from the discarding of bait, non-target catch, and offal, and other fishing practices (ecosystem/community property SEC).
- Bycatch data on seabirds, invertebrates, and non-commercial fish species are inconsistently collected in fisheries managed by DFO. The Groundfish sector is relatively information-rich because mechanisms are in place to collect bycatch data, including seabirds, as a condition of licence, although the identification of bycatch to species is limited and would benefit from the development of appropriate identification methods and tools. Other sectors (Salmon, Invertebrates, and Pelagics) either have no reporting requirement, or have not established a standardized data collection protocol for bycatch species, and are therefore information-poor.
- None of the existing commercial fishery bycatch programs regularly provide bycatch information at the scale of species or population. As a result, an evaluation of the risks resulting from bycatch impacts on species SECs in the SImNWA cannot be conducted at present. It is recommended that a list of available information on the exposure and consequence of direct bycatch mortality be compiled for bycatch species.
- Identification of seabirds and other bycatch organisms (e.g., fish, invertebrates) captured by all fishing activities is a prerequisite for a comprehensive ERAF assessment in SImNWA. However, proper identification of bycatch, beyond well-known fish species, is an important information gap in fisheries managed by DFO in Pacific Region. To address bycatch data gaps in commercial fisheries, a standardized protocol for the collection of bycatch data (location, date, number) along with methods and tools to support identification to species or population

where appropriate, and system(s) to manage bycatch data, are necessary. Development of this collection protocol and supporting tools could be informed by the data needs of other agencies with marine spatial planning and management responsibilities.

- Assessing exposure to stressors and the consequences of stressors from human activities may be relevant at the population level for some species SECs because risk may not be shared equally among populations. Some species SECs have distinct populations in or near the SImNWA, and other species SECs are part of larger pan-Pacific or global seabird populations. It is recommended that population SECs within a species be identified, if appropriate, when conducting a comprehensive ecosystem risk assessment.
- The risks associated with mechanical disruption and settling of remobilized sediments on physical and biogenic habitat SECs in SImNWA are probably confined to benthic features that support important prey species of seabirds. These risks were not assessed because there are information gaps with respect to the proper identification of prey species, such as juvenile rockfish (and their habitats), in seabird diet studies and fishery bycatch programs, in the importance of different prey species to seabirds within SImNWA, particularly in terms of critical life history events such as fledging survival, and the impacts of fishing gear on different bottom types. Research is ongoing to identify habitat types important to Pacific Sand Lance (*Ammodytes hexapterus*), which is a significant seabird (and fish) prey species, and whose abundance in diets has been related to fledgling survival of some seabird species in SImNWA.
- The impact of discards of bycatch and offal by commercial fishing activities described in a case study of the North Sea was used to identify, by analogy, the type of risks that might result from shifts in the trophodynamics of ecosystem/community property SECs within the SImNWA. While the results are not conclusive, they point to the importance of distinguishing between natural variation in seabird predators, and their seabird prey species, and those variations caused by human activities, in order to comprehensively assess the risk to ecosystem SECs. Monitoring all aspects of fishing activities (e.g., discards of target, non-target, and other bycatch species), and all predator and prey species, will be required to conduct a comprehensive ERAF assessment in the SImNWA.
- This evaluation exercise considered exposure and consequence from a single type of human activity (commercial fishing gear), and did not consider the potential risk to SECs from multiple stressors, or cumulative impacts. A broader evaluation across all human activities and potential stressors will be needed for a comprehensive ecosystem risk assessment in support of integrated ecosystem management planning in SImNWA.
- The ERAF (DFO 2012) provides a useful structure to take into account ecosystem considerations and to highlight the data needs (and current gaps) of a comprehensive ecosystem risk assessment. The results heighten awareness of the importance of conducting a systematic and well-documented scoping phase before entering into a comprehensive system analysis with the ERAF.
- Additional data gaps and research needs were identified for each type of SEC, including identifying and monitoring seabird populations and prey fish populations, further work to identify suitable habitat SECs within the SImNWA, and continued annual monitoring of the state of the ecosystem, among others.

INTRODUCTION

Three federal agencies - Environment Canada (EC), Fisheries and Oceans Canada (DFO), and Parks Canada - have regulatory tools aimed at protecting marine ecosystems in Canada's marine environment. Efforts to develop a bioregional network of Marine Protected Areas (MPAs) in the Pacific Region, and contribute to integrated ecosystem-based management approaches, both regionally and nationally, are coordinated through a joint Federal/Provincial team called the Marine Protected Areas Network Team (MPANT). EC under the *Canada Wildlife Act* can designate marine National Wildlife Areas (NWA) that are globally and nationally important to the conservation and protection of migratory birds and endangered species, and on the foraging habitat that is essential to support their populations. The first marine National Wildlife Area, which will contribute to the MPA Network, is the proposed Scott Islands marine National Wildlife Area (SImNWA).

The proposed SImNWA supports the highest concentration of breeding seabirds in Canada's Pacific waters. The recommended boundaries encompass approximately 11,546 km^2 of marine area extending from the northwest shore of Vancouver Island (Cape Scott) to the Scott Islands archipelago, which includes Cox, Lanz, Beresford, Sartine and Triangle Islands (Figure 1). The land areas on northern Vancouver Island adjacent to the proposed SImNWA, and the foreshores of the five islands within the proposed SImNWA, are protected by the Province of British Columbia as either Provincial Parks or Ecological Reserves (Figure 1). In addition, DFO has designated a Rockfish Conservation Area within the SImNWA boundaries that includes the waters around Cox, Lanz, Beresford and Sartine Islands (Figure 1).

More than 40 species of marine birds utilize the SImNWA area for breeding and/or feeding, including five species that are presently listed by the *Species at Risk Act* (SARA) under Schedule 1 as Threatened (Marbled Murrelet [*Brachyramphus marmoratus*]; Short-tailed Albatross [*Phoebastria albatrus*]; Pink-footed Shearwater [*Puffinus creatopus*], or of Special Concern (Ancient Murrelet [*Synthliboramphus antiquus*]; Black-footed Albatross [*Phoebastria nigripes*]). Commercial fishing occurs in the SImNWA area and can have a variety of impacts on marine birds, their natural habitats, and the ecosystem linkages and marine resources that support their populations, both locally and globally.

Although EC is the lead agency for the establishment of NWAs, DFO retains the regulatory authority for management of fisheries within NWAs, and works collaboratively with EC to understand the nature and extent of seabird bycatch in commercial fisheries, and to explore mitigation options. This arrangement recognizes EC's responsibilities for seabirds and the tools DFO has to mitigate the impacts of fisheries on seabirds, and has resulted in the provision of available data on seabird bycatch to EC. Seabird bycatch mitigation measures, including the use of avoidance devices (e.g., tori lines) and the recording of all catch and bycatch in logbooks, have also been introduced in licence conditions for groundfish fisheries.

EC and DFO's Ecosystem Management and Fisheries Management Branches jointly requested advice from DFO Science on the extent and nature of risks from commercial fishing activities on marine bird species, their habitats, and ecosystem functioning and community properties within the proposed SImNWA. The goals of this evaluation are to identify and inform issues that need to be addressed within an Integrated Management framework in SImNWA, to identify and prioritize gaps in knowledge, and to identify potential research or other actions to address these knowledge gaps. This evaluation, while not a comprehensive ecosystem risk assessment, is structured using the Ecosystem Risk Assessment Framework (ERAF) developed to support DFO marine spatial planning in Pacific waters (DFO 2012). Illustrative examples of exposure to stressors from commercial fishing, as well as the ecological consequences of those stressors on representative significant ecosystem components (SECs) in the SImNWA are provided.

ASSESSMENT

The ERAF was developed to support DFO Oceans program marine spatial planning in Pacific region (O et al. 2015) and was used as an organizing structure in this evaluation of exposure and consequences associated with commercial fishing stressors in SImNWA. The ERAF consists of a scoping phase in which the key features or properties of the system, including species, habitats and community/ecosystem property SECs, are identified, followed by a risk assessment phase, during which the risks of harm to each SEC from each activity and associated stressors are assessed (DFO 2012). All applications of the ERAF begin with a mandatory scoping phase, followed by the risk assessment phase, which has three different levels ranging from the largely qualitative, but comprehensive analysis of risk in Level 1, to a highly focused and fully quantitative "model-based" assessment of risk in Level 3. In the present report, the Scoping phase of the ERAF is used to identify SECs and commercial fishing stressors within SImNWA, components of a Level 1 risk assessment were engaged to identify stressors for specific SECs, and approaches for a quantitative Level 3 assessment to address risks to seabirds from commercial fishing activities in the SImNWA are proposed. The exposure and consequence terms (and their sub-terms) are not scored in this exercise.

The information to undertake this exercise is multifaceted and requires an understanding of the pathways of the effects model (POE) of commercial fishing activities, the ability to describe and discriminate between natural variation in the status of SECs stemming from changing oceanographic and geological characteristics, and variation in the status of the SEC resulting from exposure to human-generated stressors. These information needs may be similar to the information requirements of a commercial fishery stock assessment and the identification of Ecologically and Biologically Significant Areas (DFO 2004). Not all of this information is available at present, and this exercise helped to identify and prioritize some of the gaps in the information and the risks associated with the uncertainty of not having this information.

Scoping Phase

The SEC selection process was driven by the goals and objectives of the proposed SImNWA (EC 2013), which include:

1. marine habitats and ecosystem functions important for seabird foraging are protected from harmful disturbance, damage or destruction;
2. forage species utilized by seabirds are available, within the limits of natural variation, to support viable populations of seabirds nesting on the Scott Islands;
3. direct mortality of seabirds caused by human activities is minimized through the use of effective mitigation measures; and
4. in collaboration with other responsible authorities, support the implementation of recovery strategies, action plans and management plans for species listed under Schedule 1 of SARA.

A subset of representative SECs was chosen for further analysis (Table 1), since a comprehensive ecosystem risk assessment was not contemplated for this exercise. Species SECs were chosen from the seabirds that utilize the area for breeding, rearing and/or foraging to showcase different life history strategies, and differing susceptibility/interactions with commercial fishery stressors and management approaches employed to control direct seabird mortality (Goal 3). Additional emphasis was given to species listed under other Federal, Provincial or International Acts or ratified agreements (Goal 4). Habitat SECs were based on the foraging areas associated with the species SECs (Goal 1) and a review of seabird prey species and the habitat needs of these prey species (Goal 2). Ecosystem/community property SECs are based on examples in the literature demonstrating the sensitivity of community structure and

predator/prey relationships to changes in the management of certain fishing practices occurring in the SImNWA (Goal 1).

Table 1. Cross-walk between screening criteria for species, habitat, and ecosystem/community property significant ecosystem components (SECs) described in the ERAF (DFO 2012) and equivalent criteria used in SImNWA.

Species	ERAF Criterion/Criteria	SImNWA Screening Criteria
Species SECs		
Cassin's Auklet *Ptychoramphus aleuticus*	Unique, Specialized role in Food Web; IUCN Red List - Least concern, decreasing globally; BC CDC Blue list	High concentration of the world and national proportion of breeding population; highly philopatric; and forage areas
Rhinoceros Auklet *Cerorhinca monocerata*	Unique, Sensitive; IUCN Red list - Least concern, decreasing globally; BC CDC Yellow list	Genetically distinct stocks, brooding site fidelity, interactions with salmon net fisheries, surrogate for other sensitive species (e.g., Tufted Puffins *Fratercula cirrhata*)
Common Murre *Uria aalge*	Unique, Specialized Role in Food Web; IUCN Red list – least concern, increasing globablly; on BC CDC Red List	Declines in breeding success on Triangle Island; relationship with key pelagic fish; relationship with Peregrine Falcons (*Falco peregrinus*); isolation at southern end of subspecies distribution
Black-footed Albatross *Phoebastria nigripes*	Sensitive; Specialized Role in Food Web; IUCN Red List - Near threatened, increasing' globally; SARA listing listed as Special Concern; BC CDC Blue list	Indicative of problems facing other seabirds that use Canadian waters; are attracted to fishing vessels to scavenge discards and baits; population structure sensitivities; SARA listing as a species of Special Concern
Habitat SECs		
Feeding areas with pelagic oceanographic conditions supporting productivity and that provide favourable access to key prey for adult survival and juvenile rearing	Habitats supporting critical life stages; Critical for depleted species	Identifiable areas that have pelagic oceanographic conditions that provide conditions favourable for ready access to key prey for adult survival and juvenile rearing
Areas of fishing activities that attract seabirds that scavenge food from fishing vessels	Habitats supporting unique species; Habitats that modify species interactions	Areas of fishing activities that attract species that scavenge food from fishing vessels
Spawning or resting areas within the SImNWA for key prey fish species (i.e., juvenile rockfish, Pacific Sand Lance)	Habitats supporting critical life stages	Benthic habitats that support species that play a key role in the food web. Juvenile rockfish and Pacific Sand Lance are known prey species of birds' diets and have known benthic requirements.
Community/Ecosystem Property SECs		
Community structure	Functional groups	Discarding of offal, bait, and unwanted catch may increase populations of scavenging sea birds
Community trophodynamic relationships	Processes that play a critical role in the ecosystem	Management actions on discards may affect trophodynamics, including prey switching and increased mortality on some marine bird species

The evaluation focused on fishing activities that have been operating in the SImNWA region from 2007 to present. Some fishing activities outside the SImNWA also were examined, because they may impact seabirds in the SImNWA, and are within the estimated range of daily foraging excursions (60 km) made by some species SECs (e.g., Ryder et al. 2001). A POE modeling approach, based on two National CSAS advisory processes on the ecosystem impacts of trawl gear and scallop dredges (DFO 2006) and other fishing gears (DFO 2010), was used to identify potential stressors from commercial fishing activities in the SImNWA. Only POEs that result in direct mortality of species SECs or that affected SEC populations indirectly by modifying benthic habitats and ecosystem/community properties, were considered in this evaluation. The groundfish (trawl, hook and line, trap), invertebrate (shrimp trawl, prawn trap, dive), salmon (gillnet/seine, troll), and pelagics (herring, sardine, albacore tuna) fishery sectors all have fisheries within or near the SImNWA that may interact with seabirds, their prey species, and/or the habitats of prey species. Mitigation measures have been implemented in some of these fisheries to address concerns about seabird bycatch.

Quantitatively Assessing Risk

A detailed examination of risk to species, habitat and ecosystem/community property SECs in the SImNWA, based on the exposure and consequence terms in the ERAF (O et al. 2015), was conducted to identify the data needs and existing gaps in data collection needed to support a comprehensive ecosystem risk assessment. Example POEs were chosen to illustrate the issues associated with assessing risk for species SECs, habitat SECs, and ecosystem SECs (Table 2).

The stressor chosen for species SECs was direct mortality through catch and entanglement of species that are not targeted in a commercial fishery. Changes in habitat characteristics, resulting from mechanical damage or removal of physical or biogenic habitats, reduced complexity, or remobilized sediments, was chosen as the stressor for habitat SECs. Fishery impacts on trophodynamic relationships within the SImNWA were chosen as the ecosystem stressor.

Species SECs

Quantitative assessments of species SECs are used to provide advice to resource managers on the magnitude of the stressor and how it relates to the species sustainability thresholds as a measure of population size. The data needs for this analysis include:

1. the definition of population,
2. key life history parameters,
3. distribution and densities of the SEC,
4. distribution and loading (amount, persistence) of the stressors, and
5. consequences as they relate to biological targets and thresholds.

Habitat SECs

The information needed to support an analysis of stressor impacts on Habitat SECs includes:

1. a functional description of the properties that a species' aquatic habitat must have to allow successful completion of all life history stages;
2. the extent and nature of the stressors that threaten the properties that give the habitat their value to a species and resultant consequences; and
3. the spatial extent of the habitat.

Ecosystem/Community Property SECs

Assessing the risk to ecosystem/community property SECs is a complex undertaking. Some of the information needs for this assessment include:

1. an understanding of the nature and extent of interrelated stressor/response relationships;
2. data to evaluate the risks and consequences of the various scenarios; and
3. the types of management actions and the risks associated with their implementation.

Table 2. Fishery sectors known to occur within or near the SImNWA boundaries and potential stressors of commercial fishing activities identified by the pathways-of-effects approach: A ✓ means that the stressor is known to occur and is supported by documentation; a ? means that the occurrence of the stressor is suspected but is not well documented; ✳ means that the stressor occurrence is unknown; and a blank means the stressor is not believed to occur or is not applicable.

		Species SEC Stressors		Habitat SEC Stressors				Ecosystem SEC Stressor
	Status in SImNWA	Seabird Mortality	Prey Species Mortality	Reduced habitat complexity	Mechanical disruption of biogenic habitat	Mechanical disruption of physical habitat	Re-suspend sediments	Discarding of non-target fish, bait, offal, etc.
Groundfish Bottom Trawl	Ongoing	✓	✓	?	?	?	?	?
Groundfish Mid-water Trawl	Ongoing	✓	✳	-	?	?	?	?
Groundfish Longline	Ongoing	✓	✓	✳	✳	✳	?	?
Groundfish Troll	-	?	✓	-	-	-	-	?
Groundfish Trap	Ongoing	?	✓	?	?	?	?	?
Prawn Trap	Sporadic	-	✓	-	✳	✳	✳	?
Shrimp Trawl	Last fished in 2001	?	✓	?	?	?	?	?
Dive	Last fished in 2001	-	-	-	✳	✳	✳	-
Salmon net	Never[A]	?	?	-	-	-	-	-

		Species SEC Stressors		Habitat SEC Stressors				Ecosystem SEC Stressor
	Status in SImNWA	Seabird Mortality	Prey Species Mortality	Reduced habitat complexity	Mechanical disruption of biogenic habitat	Mechanical disruption of physical habitat	Re-suspend sediments	Discarding of non-target fish, bait, offal, etc.
Salmon Troll	Ongoing	?	?	-	-	-	-	✳
Sardine Seine	Last fished in 2001	-	✳	-	-	-	-	-
Herring Net[B]	Never	?	✳	-	-	-	-	-
Tuna Hook and Line[C]	Ongoing	✳	?	-	-	-	-	-

A - Commercial salmon surface net (gillnet/seine) fisheries occur in Johnson Strait rather than the SImNWA, but foraging excursions by some species SECs occur in this area.
B - Herring net fisheries have never occurred within SImNWA boundaries but occur nearby.
C - Tuna hook and line includes both troll and longline gears. Although longline gear is permitted, no licenses have been issued for this gear. Trolling activity occurs annually within and around SImNWA.

Results

Species SECs

Direct mortality of seabird SECs is occurring or is suspected to be occurring, in several fishery sectors operating within the SImNWA (Table 2). Information on the location, date, and number of birds killed is relatively good in groundfish, very poor in salmon, and non-existent in other fishery sectors. However, identification of bird mortalities to species (as well as invertebrates and non-commercial fish species) is poor across all fishery sectors. As a result, estimating the risk associated with direct seabird mortality in DFO managed fisheries, even qualitatively, is not possible at present. Additionally, there is genetic evidence of distinct populations in some species SECs in BC (e.g., Rhinoceros Auklet) and it is, therefore, possible that the risks associated with stressors are not shared equally among populations, owing to differences in size or life history attributes of these populations. In order to quantitatively estimate the risk associated with direct mortality in commercial fisheries for different seabird species in SImNWA, data on regional and global trends in abundance and population dynamics for each seabird species are also required. None of the existing commercial fishery bycatch programs consistently provide bycatch information at the scale of species or population.

Habitat SECs

It was concluded that there are no commercial fishery stressors that present any risk to feeding aggregations or areas in which seabirds are attracted by fishing activity habitat SECs (see Table 1). Although the risks associated with mechanical disruption and settling of remobilized sediments on physical and biogenic habitat SECs in SImNWA are probably confined to benthic features that support important prey species of seabirds, the impacts of these stressors are considered either unlikely or unknown (Table 2). The POEs ascribed to the fisheries in SImNWA would not likely have any effect on the type of habitat required for spawning or resting of Pacific Sand Lance (*Ammodytes hexapterus*). Resting Pacific Sand Lance utilize shallow

exposed sandy habitats that are frequently perturbed by storm events, thus the impacts of sediment remobilized by bottom contact fishing gear may be negligible, or not detectable above natural variation. In contrast, while fisheries with bottom contact may impact the habitats utilized by juvenile rockfish, these risks were not quantified because there are information gaps in seabird diet studies with respect to the proper identification of prey species such as juvenile rockfish (and their habitats), the importance of different prey species to seabirds within SImNWA, particularly in terms of critical life history events such as fledging survival, and the impacts of fishing gear on different bottom types.

Ecosystem/Community Property SECs

Assessing the risk to ecosystem/community property SECs is challenging. A case study of bycatch and offal discarding practices by commercial fishing activities in the North Sea (e.g., Votier et al. 2004) was used to identify by analogy the type of risks that might be associated with shifts in the trophodynamics of ecosystem/community property SECs within the SImNWA (Table 2). Although there are no direct parallels in SImNWA at present, the North Sea study highlights the importance of distinguishing between natural variation of SECs and variation caused by human activities, in order to comprehensively assess the risk to ecosystem/community property SECs in the SImNWA. The North Sea case study also highlights the importance of monitoring all aspects of fishing activities (e.g., discards of target and bycatch species).

Sources of Uncertainties

Risks to significant ecosystem components (SECs) within the SImNWA posed by cumulative impacts of multiple stressors, other than those originating from fishery activities, were not considered in this analysis.

The analysis focused solely on the risks associated with fishing gear. Other stressors associated with fishing operations, such as the release of debris and chemicals and increased noise and light levels from fishing vessels, were not considered.

CONCLUSIONS

The analysis explored the information needs for a comprehensive risk analysis with the ERAF and identified some significant information gaps. A list of data needs was compiled by SEC category (species, habitat, ecosystem/community properties) and assessed against data collection programs in DFO and EC and recommendations were provided to address gaps between data needs and currently available data.

Fishing activities that may impact SECs, as illustrated through the POE approach, have historically occurred and continue to occur, in SImNWA. Stressors from these activities include direct mortality of seabirds, mechanical disruption and settling of remobilized sediments on physical and biogenic habitats that support seabirds or their essential prey organisms, and alterations in food web dynamics through the provision of alternative food sources resulting from the discarding of bait, non-target catch, and offal, and other fishing practices.

Bycatch data on seabirds, invertebrates, and non-commercial fish species are inconsistently collected in fisheries managed by DFO. The Groundfish sector is relatively information rich because mechanisms are in place to collect bycatch data, including seabirds, as a condition of licence, although the development of appropriate methods and tools is needed to improve the identification of most bycatch species. Other sectors (Salmon, Invertebrates, Pelagics) either have no reporting requirement, or have not established a standardized data collection protocol for bycatch species and are therefore information-poor.

None of the existing commercial fishery bycatch programs regularly provide information at the scale of species or population. As a result, an evaluation of the risks resulting from bycatch impacts on species SECs in the SImNWA cannot be conducted at present.

Identification of seabirds and other bycatch organisms (e.g., non-commercial fish, invertebrates) captured by all fishing activities is a prerequisite for a comprehensive ERAF assessment in SImNWA. However, proper identification of bycatch, beyond well-known fish species, is an important information gap in fisheries managed by DFO in Pacific Region.

Assessing exposure and the consequences of stressors from human activities may be relevant at the population level for some species SECs because the risks may not be shared equally among populations.

The impact of discards of bycatch and offal by commercial fishing activities described in a case study of the North Sea was used to identify by analogy the type of risks that might result from shifts in the trophodynamics of ecosystem/community property SECs within the SImNWA. While the results are not conclusive, they point to the importance of distinguishing between natural variation in seabird predators, and associated seabird species, and those variations caused by human activities, in order to comprehensively assess the risk to ecosystem SECs. Monitoring all aspects of fishing activities (e.g., discards of target, non-target, and other bycatch species), and all predator and prey species, will be required to conduct a comprehensive ERAF assessment in the SImNWA.

Although this evaluation was not a comprehensive ecosystem risk assessment, the ERAF (DFO 2012) provides a useful structure to take into account ecosystem considerations and to highlight the data needs (and current gaps) of such an assessment. The results heighten awareness of the importance of conducting a systematic and well-documented scoping phase before entering into a comprehensive system analysis with the ERAF.

Recommendations

It is recommended that a list of available information on the exposure and consequence of direct bycatch mortality be compiled for bycatch species.

To address bycatch data gaps in commercial fisheries, a standardized protocol for the collection of bycatch data (location, date, number) along with methods and tools to support identification to species or population where appropriate, and system(s) to manage bycatch data, are necessary. Development of this collection protocol and supporting tools could be informed by the data needs of other agencies with marine spatial planning and management responsibilities.

It is recommended that population SECs within a species should be identified, if appropriate, when conducting a comprehensive ecosystem risk assessment, because risks may not be shared equally among populations.

Within the context of undertaking a full ERAF analysis for the SImNWA, a number of additional data gaps and research needs were identified for each type of SEC, including identifying and monitoring seabird populations and prey fish populations, further work to identify suitable habitat SECs within the SImNWA, and continued annual monitoring of the state of the ecosystem, among others.

SOURCES OF INFORMATION

This Science Advisory Report is from the August 6-7, 2014 meeting on Characterization of Fishery Effects on Valued Species, Habitat, and Ecosystem Components of the Proposed Scott Islands Marine National Wildlife Area. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

DFO. 2004. Identification of ecologically and biologically significant areas. DFO Can. Sci. Advis. Sec. Ecosystem Status Rep. 2004/006: 15p.

DFO. 2006. Impacts of trawl gears and scallop dredges on benthic habitats, populations and communities. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/025.

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